In the Claims

Please cancel claims 1, 7 and 12 as; the limitations of claim 1 have been incorporated into amended independent claims 20 and 21; the limitations of claim 7 have been incorporated into amended independent claims 26 and 27; and the limitations of claim 12 have been incorporated into amended independent claims 32 and 33.

Please amend the claims as follows:

B1

2. (Amended) The method of claim 21 wherein the substrate is employed within a microelectronic fabrication selected from the group consisting of integrated circuit microelectronic fabrications, ceramic substrate microelectronic fabrications, solar cell optoelectronic microelectronic fabrications, sensor image array optoelectronic microelectronic fabrications and display image array optoelectronic microelectronic fabrications.

Sub E1

3. (Amended) The method of claim 21 wherein the silicon layer is selected from the group consisting of monocrystalline silicon layers, polycrystalline silicon layers and amorphous silicon layers.

4. (Amended) The method of claim 21 wherein:

the silicon layer is masked with a mask layer, and

the mask layer is selected from the group consisting of silicon containing dielectric hard mask layers and photoresist mask layers.

5. (Amended) The method of claim 21 wherein the seasoning polymer layer is formed of a material selected from the group consisting of:

B1 cont

Sub E1

silicon and bromine containing seasoning polymer materials;

silicon, bromine and oxygen containing seasoning polymer materials;

silicon and chlorine containing seasoning polymer materials;

silicon, chlorine and oxygen containing seasoning polymer materials;

silicon, bromine and chlorine containing seasoning polymer materials; and

silicon, bromine, chlorine and oxygen containing seasoning polymer materials.

B2

8. (Amended) The method of claim 27 wherein the substrate is employed within a microelectronic fabrication selected from the group consisting of integrated circuit microelectronic fabrications, ceramic substrate microelectronic fabrications, solar cell optoelectronic microelectronic fabrications, sensor image array optoelectronic microelectronic fabrications and display image array optoelectronic microelectronic fabrications.

Sub E2

9. (Amended) The method of claim 27 wherein:

the first monocrystalline silicon layer is masked with a mask layer; and

the mask layer is selected from the group consisting of silicon containing dielectric hard mask layers and photoresist mask layers.

10. (Amended) The method of claim 27 wherein the seasoning polymer layer is formed of a material selected from the group consisting of:

silicon and bromine containing seasoning polymer materials;

silicon, bromine and oxygen containing seasoning polymer materials;

silicon and chlorine containing seasoning polymer materials;

B2 silicon, chlorine and oxygen containing seasoning polymer materials;

cont Sub C7 silicon, bromine and chlorine containing seasoning polymer materials; and

silicon, bromine, chlorine and oxygen containing seasoning polymer materials.

13. (Amended) The method of claim 33 wherein the substrate is employed within a microelectronic fabrication selected from the group consisting of integrated circuit microelectronic fabrications, ceramic substrate microelectronic fabrications, solar cell optoelectronic microelectronic fabrications, sensor image array optoelectronic microelectronic fabrications and display image array optoelectronic microelectronic fabrications.

B3

Sub C3 14. (Amended) The method of claim 33 wherein:

the polycrystalline silicon layer is masked with a mask layer; and

the mask layer is selected from the group consisting of silicon containing dielectric hard mask layers and photoresist mask layers.

Docket: CS 99 - 065
S/N: 09/442,499

15. (Amended) The method of claim 33 wherein the seasoning polymer layer is formed of a material selected from the group consisting of:

silicon and bromine containing seasoning polymer materials;

silicon, bromine and oxygen containing seasoning polymer materials;

silicon and chlorine containing seasoning polymer materials;

silicon, chlorine and oxygen containing seasoning polymer materials;

silicon, bromine and chlorine containing seasoning polymer materials; and

silicon, bromine, chlorine and oxygen containing seasoning polymer materials.

Sub B3 B3 cont

17. (Amended) The method of claim 21, wherein the dummy wafer seasoning methods include a method selected from the group consisting of:

i) a silicon oxide coated dummy wafer method;

ii) a silicon oxide coated dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas; and

iii) a silicon dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas.

B4

18. (Amended) The method of claim 21, wherein the dummy wafer seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 1 to 500 mTorr;

a source radio frequency power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a dummy wafer temperature of from about 20 to 200°C;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure ~~of~~ from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

B4
cont

19. (Amended) The method of claim 21, wherein the product wafer in-situ seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a product substrate temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

20. (Amended) A method for forming an etched silicon layer comprising:

providing a first substrate having formed thereover a first silicon layer;

etching the first silicon layer to form an etched first silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active chlorine containing etchant species, wherein within the plasma etch method:

B4 cont

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods; wherein the waferless seasoning methods employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds;

(2) the first silicon layer is etched to form the etched first silicon layer within the seasoned plasma reactor chamber; and

(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first silicon layer to form the etched first silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second silicon layer to form an etched second silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

B4 cont

21. (Amended) A method for forming an etched silicon layer comprising:

providing a first substrate having formed thereover a first silicon layer;

etching the first silicon layer to form an etched first silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active chlorine containing etchant species, wherein within the plasma etch method:

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods;

(2) the first silicon layer is etched to form the etched first silicon layer within the seasoned plasma reactor chamber; wherein the first silicon layer etch step, when using an eight inch diameter substrate, employs:

Sub C1

a reactor chamber pressure of from about 1 to 500 mTorr;

a radio frequency source power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz and an external bias power of up to about 500 watts;

B4 cont

a substrate temperature and a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss; and

(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first silicon layer to form the etched first silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second

silicon layer to form an etched second silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

22. (Amended) The method of claim 21, wherein the seasoned plasma reactor chamber cleaning step, when using an eight inch diameter substrate, employs:

a seasoned plasma reactor chamber pressure of from about 50 to 500mTorr;

a source radio frequency power of from about 100 to 200 watts at a source radio frequency of from about 2 to 13.56 MHz and a bias power of up to about 500 watts;

a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a nitrogen trifluoride or a sulfur hexafluoride flow rate of from about 10 to 500 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss.

23. (Amended) The method of claim 27, wherein the dummy wafer seasoning methods include a method selected from the group consisting of:

i) a silicon oxide coated dummy wafer method;

ii) a silicon oxide coated dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas; and

34 cont

iii) a silicon dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas.

24. The method of claim 27, wherein the dummy wafer seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 1 to 500 mTorr;

a source radio frequency power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a dummy wafer temperature of from about 20 to 200°C;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

25. The method of claim 27, wherein the product wafer in-situ seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a product substrate temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

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26. (Amended) A method for forming an etched monocrystalline silicon layer comprising:

B5

providing a first substrate having formed thereover a first monocrystalline silicon layer;

etching the first monocrystalline silicon layer to form an etched first monocrystalline silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active chlorine containing etchant species, wherein within the plasma etch method:

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods; wherein the waferless seasoning methods employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

B5 cont

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds ;

(2) the first monocrystalline silicon layer is etched to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber; and

(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first monocrystalline silicon layer to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second monocrystalline silicon layer to form an etched

second monocrystalline silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

27. (Amended) A method for forming an etched monocrystalline silicon layer comprising:

providing a first substrate having formed thereover a first monocrystalline silicon layer;

etching the first monocrystalline silicon layer to form an etched first monocrystalline silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides at least one of an active bromine containing etchant species and an active chlorine containing etchant species, wherein within the plasma etch method:

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods;

(2) the first monocrystalline silicon layer is etched to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber; wherein the first monocrystalline silicon layer etch step, when using an eight inch diameter substrate, employs:

a reactor chamber pressure of from about 1 to 500 mTorr;

a radio frequency source power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz and an external bias power of up to about 500 watts;

a substrate temperature and a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss~~; and~~

(3) the seasoning polymer layer is ~~cleaned~~ from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first monocrystalline silicon layer to form the etched first monocrystalline silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second monocrystalline silicon layer to form an etched second monocrystalline silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

28. The method of claim 27, wherein the seasoned plasma reactor chamber cleaning step, when using an eight inch diameter substrate, employs:

a seasoned plasma reactor chamber pressure of from about 50 to 500mTorr;

a source radio frequency power of from about 100 to 200 watts at a source radio frequency of from about 2 to 13.56 MHz and a bias power of up to about 500 watts;

a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a nitrogen trifluoride or a sulfur hexafluoride flow rate of from about 10 to 500 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss.

29. The method of claim 33, wherein the dummy wafer seasoning methods include a method selected from the group consisting of:

i) a silicon oxide coated dummy wafer method;

ii) a silicon oxide coated dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas; and

iii) a silicon dummy wafer method in conjunction with the seasoning plasma etch method additionally employing an oxygen containing etchant gas.

30. The method of claim 33, wherein the dummy wafer seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 1 to 500 mTorr;

a source radio frequency power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a dummy wafer temperature of from about 20 to 200°C;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

31. The method of claim 33, wherein the product wafer in-situ seasoning methods, when using an eight inch diameter substrate, employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature and a product substrate temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds.

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32. (Amended) A method for forming an etched polycrystalline silicon layer comprising:

providing a first substrate having formed thereover a first polycrystalline silicon layer;

B6

etching the first polycrystalline silicon layer to form an etched first polycrystalline silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides an active bromine containing etchant species, wherein within the plasma etch method:

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods; wherein the waferless seasoning methods employ:

a plasma reactor chamber pressure of from about 50 to 1000 mTorr;

a source radio frequency power of from about 10 to 1000 watts at a source radio frequency of from about 2 to 13.56 MHz;

a plasma reactor chamber temperature of from about 20 to 200°C;

a silicon containing seasoning polymer layer forming gas flow rate of from about 1 to 200 sccm;

a bromine and/or chlorine containing etchant gas flow rate of from about 10 to 200 sccm;

an optional oxygen containing etchant gas flow rate of from about 1 to 50 sccm;

a magnetic field of up to about 200 gauss; and

a plasma seasoning time of from about 5 to 120 seconds;

(2) the first polycrystalline silicon layer is etched to form the etched first polycrystalline silicon layer within the seasoned plasma reactor chamber; and

(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first polycrystalline silicon layer to form the etched first polycrystalline silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second polycrystalline silicon layer to form an etched second polycrystalline silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

B6 cont

33. (Amended) A method for forming an etched polycrystalline silicon layer comprising:

Sub 3

providing a first substrate having formed thereover a first polycrystalline silicon layer;

etching the first polycrystalline silicon layer to form an etched first polycrystalline silicon layer while employing a plasma etch method employing a plasma reactor chamber in conjunction with a plasma etchant gas composition which upon plasma activation provides an active bromine containing etchant species, wherein within the plasma etch method:

Sub B7

(1) a cleaned plasma reactor chamber is seasoned to provide a seasoned plasma reactor chamber having a seasoning polymer layer formed therein; wherein the seasoning method is selected from the group consisting of dummy wafer seasoning methods, product wafer in-situ seasoning methods and waferless seasoning methods;

(2) the first polycrystalline silicon layer is etched to form the etched first polycrystalline silicon layer within the seasoned plasma reactor chamber; wherein the first polycrystalline silicon layer etch step, when using an eight inch diameter substrate, employs:

B6 cont

a reactor chamber pressure of from about 1 to 500 mTorr;

a radio frequency source power of from about 10 to 2000 watts at a source radio frequency of from about 2 to 13.56 MHz and an external bias power of up to about 500 watts;

a substrate temperature and a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a hydrogen bromide flow rate of from about 10 to 200 sccm;

an oxygen flow rate of from about 1 to 50 sccm;

a nitrogen trifluoride flow rate of from about 1 to 50 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss; and

Sub C3

B6 cont

(3) the seasoning polymer layer is cleaned from the seasoned plasma reactor chamber to provide the cleaned plasma reactor chamber after etching the first polycrystalline silicon layer to form the etched first polycrystalline silicon layer within the seasoned plasma reactor chamber prior to etching a second substrate having formed thereover a second polycrystalline silicon layer to form an etched second polycrystalline silicon layer formed over the second substrate within the plasma reactor chamber while employing the plasma etch method in accord with (1), (2) and (3).

34. The method of claim 33, wherein the seasoned plasma reactor chamber cleaning step, when using an eight inch diameter substrate, employs:

Sub E4

a seasoned plasma reactor chamber pressure of from about 50 to 500mTorr;

a source radio frequency power of from about 100 to 200 watts at a source radio frequency of from about 2 to 13.56 MHz and a bias power of up to about 500 watts;

a seasoned plasma reactor chamber temperature of from about 20 to 200°C;

a nitrogen trifluoride or a sulfur hexafluoride flow rate of from about 10 to 500 sccm;

a backside cooling gas pressure of from about 1 to 50 torr and a flow rate of from about 2 to 50 sccm; and

a magnetic field of up to about 200 gauss.